

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Wages and Inflation

IN a happier future it is conceivable that a democratic people will acquire the habit of looking ahead and of basing their actions upon a knowledge of their consequences. The uncomfortable fact that action and reaction are equal and opposite will be more widely understood and we shall avoid some, at least, of those headlong descents into trouble which all through history have been characteristic of mob and faction. We can already congratulate ourselves that the dangers of inflation are widely appreciated and certainly better understood than at any previous time. We have witnessed the disasters which overwhelmed first Austria, then Germany, and in a lesser degree many other countries, because they failed to control the desire to spend money, in markets bereft of goods. We ourselves suffered serious hardships from a milder attack of the same disease during and after the Great War.

Inflation is a pleasant process while it lasts. Goods are readily bought because it is certain that while inflation continues their money value will increase. When, however, the top of the curve has been reached and the inevitable downward trend begins, goods become hard to sell because it is equally certain that their money value will decrease. Then follow unemployment and all the rest with which we are sufficiently familiar.

The authorities can do and indeed are doing something, by cumbersome processes such as rationing, to guard against these disasters, but authority counts for very little against the weight of spending power now possessed not by the banks or the money owners or employers or capitalists, but by the millions of wage-earners to whom war brings unfamiliar gains. In both France and Germany this part of the war problem has been solved by compulsion and there are those who would apply similar methods here. Mr. Maynard Keynes's deferred pay scheme is of that variety. The results are by now obvious enough in France, and will be seen in due course in Germany. It is unthinkable that we should descend to such depths in the cause of democracy. These circumstances are held by some to justify an attack on wages, and plenty of examples of anomalies and extremes are ready to hand to support such a campaign.

There is, however, a better way, full of promise for the wage-earners themselves, a way which should be shown to them by their own leaders. Very few Britons would resist the proposition that anyone who *spent* more in war time than was his habit in times of peace, is doing a disservice to his country. In trade union language he might well be dubbed a "scab." A wide-

spread appreciation of this simple proposition and its enthusiastic acceptance by wage-earners would remove from the list of our problems the greater part of the bogey of inflation. It would keep prices down to-day, would greatly lessen the risk of unemployment after the war and smooth out the future. It would, however, do much more than that. Some of our readers may have noticed the annual table of the growth of small savings, published last week by Dr. J. F. L. Bray, the Economic Adviser to the United Kingdom Provident Institution, proving beyond a doubt that in recent times our workers have learnt the virtues of saving. If only that lesson were faithfully applied to the period of the war, the workers themselves could bring about a social revolution on a scale beyond the dreams of political reformers. We are paying out at the present time some hundreds of millions a year in *extra* wages, that is to say, in wages which were not paid a year ago. Some of this extra money, going as it does into the pockets of people who were below the subsistence line must, of course, be spent, but nine tenths of it could be saved. This is not altogether a question of winning the war, but of winning also the peace.

Finance has never stopped a war; Germany has no finance and will pay as before, whether she wins or loses, in the sufferings of her people. It is not unreasonable, in these circumstances, to ask the British worker to make his contribution to the war effort by giving all his time and skill and strength, receiving in return a proper monetary reward, and to make an even easier contribution to the peace effort by refraining until victory is secured from spending his extra money. The case is so simple, so obvious, so full of advantage to the nation and to the worker himself, as to cause us to wonder at the little that is now made of it. Manufacturers and employers who, by legislation and budgets, have been reduced to a minor influence in great financial problems such as this, are doing what they can by promoting Savings Groups, but the Labour Movement generally has not risen to its responsibilities in this matter. Sir Robert Kindersley is doing marvels, and is entitled to a better backing. There must be an awakening in the minds and hearts of all wage-earners if we are to be spared all the ghastly consequences of the printing-press and inflation, or alternatively to be saved from a deadly blow to Liberty such as is proposed in the Keynes or other schemes for compulsory saving. Thrift is only a virtue and a blessing when it is voluntary. In any other form it becomes, not a step to the better life, but the straight road to slavery.

NOTES AND COMMENTS

Purchase Tax Exemption

THE Chancellor of the Exchequer's announcement, in the House of Commons on Tuesday, that he had decided to delete newspapers, books and periodicals from the scope of the Purchase Tax, is widely welcomed. The importance of the contribution made by trade journals to the war effort was the subject of comment in these columns last week and was emphasised by Sir Kingsley Wood on Tuesday, when he said he certainly did not think that in this time of war there should be either a decrease in the circulation of newspapers or in the services they provided. Not only a free Press, but a widely distributed Press, declared the Chancellor, was a vital factor, to-day particularly, in the dissemination of information and the maintenance of public morale. Had the tax been imposed on newspapers, in many cases their circulation would have been adversely affected and in others even their continuance would have been at stake. The Chancellor's decision means, for the present at any rate, that papers such as *THE CHEMICAL AGE* will be able to continue to maintain the high standard which a Ministry of Information official recently insisted was of no little importance. A hint that the decision is subject to alteration was contained in the Chancellor's statement that "while there were other considerations, he did not feel justified in maintaining the tax on newspapers in present circumstances."

Dominion Chemists

WHETHER it is true or not, there is a report circulating in neutral countries that the supply of chemists in Great Britain is not proving sufficient to meet the present requirements. Anyone who wishes may call at this office and inspect an extract to that effect from an American technical monthly. In any event, it is surprising to read, in a leading article in the July issue of *Canadian Chemistry and Process Industries*, that many Canadian chemists are either enlisting in active service units or are seriously considering such action, feeling that they are doing little of importance in their present posts. They feel no confidence that authority is likely to offer them positions of national importance in the chemical world, but are anxious to be of use at once in the present emergency. There exists in Canada an institution called the Voluntary Technical Registration Service Bureau, corresponding apparently to the Central Register here, and it seems that many offers of help from chemists and other technicians have become buried in its files. Hence the influx of patriotic Canadian chemists into the non-technical ranks. If there is really a shortage of chemists in this country, we suggest it might be worth while to request an exploration of the files of the Canadian register, with a view to enlisting the support of technical assistance from the Dominion in addition to the splendid military aid that has so willingly been offered.

Germany through American Eyes

GUARDED optimism (from the German point of view) may be said to be the keynote of American opinion concerning Germany's present economic position in the chemical and metallurgical industries, as expressed by the German correspondent of *Chemical and Metallurgical Engineering*. The apparent economic gain derived from the occupation of industrial areas in north-western Europe is offset by the necessity of providing raw

materials to feed the plant, not to mention victuals to feed the operatives. The steel industry of Luxembourg is reported to be now working normally, drawing its coke supply from the Ruhr; but some doubt exists concerning the Belgian iron, steel, and textile works. Some of these may have been destroyed by the passage of war; others may be dependent on unattainable supplies of chemicals, formerly imported from abroad, though coal, of course, can be readily secured. It is known, for example, that since the Solvay chemical organisation became international in scope there had been an increasing tendency to import additional chemical supplies from abroad, merely maintaining the output of the Belgian soda-products works at their previous level. Doubtless, however, the Belgian glue and gelatin factories will be exploited to the full. In Holland, large warehoused stocks of chemicals and metals must have been acquired by the Germans, but on the exhaustion of these, Dutch industry, which was greatly dependent on colonial raw material, will come more or less to a standstill. The same is very largely true of the industry of northern and western France, but the important potash deposits of Lorraine and the coal mines there and in Artois are a valuable asset. From Norway it is reported that the Norsk hydro nitrogen works (in which I. G. Farbenindustrie are interested) have now resumed operations, and the molybdenum mines at Fjotland are said to be working to capacity. The maintenance of the enormous supplies of raw materials and food requisite for an intense war effort remains Germany's greatest problem, and there are signs, too, of a growing shortage of skilled workers.

Element 85

THE Swiss scientist, Dr. W. Minder, of Berne University, is stated, in a report in *The Times*, to have succeeded in isolating the element with the number 85 in the periodic table, which he has named "helvetium" in honour of his native country. He has proved, it is claimed, that helvetium is produced in small quantity in the decomposition of actinium. A claim to have traced this same element by magneto-optic methods was made in 1931 by Allison and others, who wished to call the new element "alabamine," also for reasons of local patriotism, and we would suggest that the termination chosen by the Americans was more appropriate than the "—ium" mooted by Dr. Minder. The missing element is, of course, in the halogen series and corresponds to eka-iodine, to use the provisional nomenclature of Mendeléeff, and it would obviously be more convenient to keep the same type of termination for all the halogen elements, reserving the other for the still elusive eka-caesium (? virginium), which occupies the number 87 in the periodic table at the head of the alkali metal group.

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Textile Uses of Titanium Compounds

Satisfactory Properties of Dioxide and Salts

by G. S. RANSHAW

IT was not until 1928 that the successful separation of titanium dioxide on a commercial scale was accomplished. Since that date, however, the development of titanium compounds for industrial purposes has been rapid. As is well known, large quantities of the dioxide are used as a pigment, both in the paint and textile printing industries, while the rayon industry utilises it for the production of matt or delustrated viscose rayon. The chloride and the sulphate are employed in the dyeing and finishing trades, as are a number of other compounds to be mentioned later, whilst titanium soaps have been used in waterproofing with some measure of success.

The most important source of titanium is titaniferous iron ore, or ilmenite, which is ferrous titanate. Ilmenite is highly resistant to the usual chemicals such as sulphuric acid and caustic soda, so that attempts to work deposits of titanium met with considerable difficulty.

One group of methods depends on the dissolution of both the titanium and the iron, the ilmenite being treated with either sulphuric acid, sodium hydrogen sulphate, or hydrofluoric acid. The titanium dioxide is separated in the first two cases by hydrolysis; in the latter case the titanium fluoride is volatilised.

Another group of methods depends on dissolving the iron alone, the ore being fused with caustic soda and then treated with acid. A third group volatilises the titanium by treating the ilmenite with carbon, chlorine being subsequently passed over the heated mass. The latter method was developed by Carteret and Devaus in France. Chlorine was passed over a heated mixture of carbon and crushed ore, producing titanium tetrachloride which distilled over at 136° C. At this temperature the titanium is separated from the iron, the titanium tetrachloride being hydrolysed on exposure to air and moisture, to form titanium hydroxide $\text{Ti}(\text{OH})_3$. It was found, however, that the separation from the iron was not complete, a certain proportion of the iron coming over as ferric chloride. Further purification was necessary, which added to the cost of production.

Production of Titanium Dioxide

The method which has stood the test of practice is that by which both the titanium and the iron are extracted from the ore by treatment with concentrated sulphuric acid. The titanium and ferrous sulphates are then extracted by water, and the solution warmed and agitated. Hydrolysis of the titanium sulphate is promoted and, conditions being properly controlled, a complete separation from iron is effected. The precipitated and washed titanium hydroxide is calcined under strict control so as to convert each molecule of hydroxide into crypto-crystalline dioxide, avoiding the complete change to the holo-crystalline.

The process of calcination is very important for the production of a dioxide having just the right properties for the delustering of rayon, *i.e.*, chemical stability and high refractive index. With regard to the latter, the refractive index of the hydroxide is 1.8 while that of the properly calcined dioxide is 2.7. Over-calcination, moreover, causes agglomeration of the original particles, and a hard, gritty product is of little use for delustering, as it has been found difficult to grind it down to the requisite dimensions. The larger agglomerates, in addition, considerably increase the danger of blocking the holes in the spinnerets and their presence in the yarn causes faults to arise when fabrics are being woven.

The exceptional resistance of titanium dioxide to acid and alkaline reagents has made it an exceptionally successful product for the delustering of rayon, but it displays the further advantage that it is completely free from any tendency to

discoloration which may be brought about by the presence of sulphuretted hydrogen, sulphur dioxide, carbon bisulphide and other sulphur compounds. While titanium dioxide has several reactions with sulphur and its compounds, all these are dependent on the attainment of high temperatures. The passage of hydrogen sulphide or carbon bisulphide vapour over red-hot titanium dioxide produces a sulphide of titanium, although sulphur dioxide is without action in similar circumstances.

In addition to the physical and chemical properties mentioned above as being favourable to its use as a delustrant, the pigment possesses a high covering power, comparing most favourably in this respect with other white pigments. Taking lead carbonate as a standard, and assigning to it a value of 100, titanium dioxide is represented by 1000 and zinc oxide by 200.

To complete this short account of the dioxide it may be stated that one well-known product commercially available proved on analysis to be 98 per cent. pure, while as regards size, 99 per cent. of the powder was under two microns.

Properties of the Chlorate and Sulphate

In addition to the dioxide, a number of salts, of which the basic oxide is titanous oxide (Ti_2O_3) have interesting textile applications. Titanous chloride and titanous sulphate have strong reducing properties and are used in the bleaching of fabrics, also for the discharging of colour. The use of the latter product is increasing, particularly in the case of silk and wool products which may be injured by the employment of bleaching agents in which chlorine is the active agent, but it is preferably used in its stabilised form owing to the following considerations. Titanous sulphate is an active acid reducing agent which is itself oxidised to titanic sulphate. On the formation of the salt of the higher oxide there may be hydrolysis of the titanic sulphate to titanium hydroxide, which is precipitated in the bath and becomes fixed on the fabric. There thus arises the possibility of patchiness on re-dyeing, and the special mordanting effect of the titanium hydroxide requires consideration. The stabilised form of the sulphate, however, is not hydrolysed either at high or low concentrations and temperatures. The possibility of tendering has also been avoided.

The use of stabilised titanous sulphate for stripping dyed colours refers especially to the discharging of direct colours dyed on cotton, though it may be extended to other classes of dyestuffs dyed on this material as well as on other fibres.

In the dyeing of cotton with direct colours it sometimes happens that a wrong shade is obtained which is too deep for a match, or the dyeing may have taken place unevenly. In such cases the only alternatives open to the dyer are to strip and re-dye, or to dye to a darker shade and dispose of the goods with the least possible loss. For stripping, the ordinary bleaching agents are not suitable on account of the concentration required to remove the dye; this in many cases makes tendering inevitable. If, however, such goods are run through a hot and very dilute solution of titanous sulphate the destruction of the colour will usually take place in a very few minutes. The goods are then ready to be re-dyed after having been washed.

Primuline Yellow, Thioflavine S and some other dyestuffs belonging to this class cannot be stripped by titanous sulphate, but these exceptions do not include the direct pinks. Paranitriline Red and Naphthylamine Claret may be stripped, but the action is not so rapid as in the case of ordinary direct colours. Of equal importance is the stripping of colours from garments, curtains, etc., previous to re-dyeing.

By means of titanous sulphate it is possible to use the methods described above. Moreover, the compound has its use in clearing whites. In the finishing of fancy coloured goods which contain yarns dyed with azo dyes it frequently happens that a small amount of the colour bleeds into the white, thus spoiling the effect. In such cases the white can instantly be cleared by running the goods through a hot, dilute solution of titanous sulphate and then rinsing in water.

In dyeing piece goods with Indanthrene Blue, titanous sulphate has a marked effect in brightening the colour if used with hydrochloric acid when souring; or Indanthrene Blue which has been dulled by excessive chroming can be restored by running the goods through a weak solution of titanous sulphate and common salt.

The use of this compound of titanium in textile printing extends both to resist and discharge works. For discharging the direct colours it has been found more effective than stannous chloride, of which it is always necessary to employ a large excess over and above the amount required by theory. Moreover, such colours as Chrysophenine which are scarcely acted on by stannous chloride are readily discharged by titanous sulphate. It possesses a fairly strong acid reaction, however, to counteract which it is advisable to add some such substance as ammonium sulphocyanide or sodium formate to the printing paste. After printing, the goods should be steamed for two minutes in a rapid ager.

Double Salts of Titanium

The most stable compounds of titanium are those with hydrofluoric acid, namely, titanium fluoride and the double fluoride of titanium and potassium. The two most important salts, however, are the double oxalate of titanium and potassium and the double sulphate of titanium and sodium. The

latter is an excellent mordant for the wool fibre. On wool mordanted with titanium the alizarine colours give shades which are faster to light than those produced by chroming. With alizarine red and yellow faster shades are obtained than those obtained on wool mordanted with aluminium, and the dyeings are also bright. Titanium salts give excellent results with the acid colours capable of chrome treatment. These titanium salts are excellent fixatives for cotton fibres impregnated with tannin. Their advantage over antimony salts is that they give coloured combinations the formation of which constitutes an appreciable "bottom" for subsequent dyeing with basic colours.

Soaps for Waterproofing

Titanium soaps form another interesting application of compounds of titanium to textile processes since they have been found useful in certain types of waterproofing. They are formed, according to one patent, by the addition of titanium sulphate to a sodium soap. Taking sodium stearate, caustic soda is added to the requisite amount of stearate, both solutions being at 70° C. The titanium is added in solution as titanium sulphate, the whole being efficiently agitated. The titanium soap is then separated, washed and dried. Success depends largely on control of the temperature and the efficient mixing of the titanium sulphate.

In conclusion, the colloidal form of titanium dioxide may be mentioned. This is an interesting product, although industrial applications, so far as the writer knows, are not fully developed as yet. It was obtained by Rose in a gelatinous form by adding tartaric acid to an acid solution of the chloride. On the addition of ammonia the titanium dioxide is precipitated as a gelatinous mass. This is washed with water and purified by dialysis.

Chemical Matters in Parliament

Spent Shale

IN the House of Commons last week Mr. A. Edwards asked the Secretary for Petroleum when he could give the analysis of Scottish shale residue after treating to remove oil.

Mr. Geoffrey Lloyd replied that he was circulating with the Official Report a statement showing the result of the analysis of a typical spent shale as discharged from the retorts.

Mr. Edwards: As this material contains a substantial percentage of aluminium, will the hon. gentleman call the attention of the Minister for Aircraft Production to a very valuable aluminium lying dormant?

Mr. Lloyd: Certainly, sir.

The analysis is as follows:—

	Per cent.
Carbon	3
Silica	48.5
Alumina	25.2
Iron Oxide	12.1
Lime	5.3
Magnesia	2.2
Sulphuric anhydride	3.2
Chlorides	Trace
Alkalis	Trace

Chemists in Military Service

Mr. Parker asked the Minister of Supply what steps were taken to get chemists released from the armed Forces when he required their services; and how many had been so released?

Mr. H. Morrison, assuming that the question referred to analytical and research chemists, and not to pharmaceutical chemists, replied that applications from Ministry of Supply establishments and contractors for the release of such chemists were considered on their merits and, where the cir-

cumstances warranted, recommendations for release were submitted to the Service Department concerned. The number of such recommendations for release had not been large, but an exact figure would demand the expenditure of a disproportionate amount of time and labour in examining records. These occupations were reserved at the age of 21.

Mr. Parker further asked the Minister of Labour why military hardship committees in some cases were ignoring the recommendations of the joint recruiting boards that chemistry students, at the end of their second year, should be allowed another year's postponement of military service?

Mr. Bevin answered that effect was given to such recommendations without reference to hardship committees; he would be glad to have particulars of any cases in order that he might make inquiries.

Dead Sea Aluminium

Mr. David Adams asked the Under-Secretary of State for the Colonies whether he was aware of the extensive deposits of aluminium near the Dead Sea; and whether, in view of the urgent demand for this metal, the Government proposes to encourage the production of the same in this area?

Mr. George Hall, in reply, stated that the deposits of aluminium sulphate which exist near the Dead Sea were not normally worked for the production of aluminium, the commercial source of which is bauxite, but he would be glad to have details of any information indicating that aluminium could be produced on an economic basis from these deposits.

Mr. Adams said that he was advised that these deposits could profitably be worked for the production of aluminium, and suggested that this should be done.

Mr. E. Shinwell: Surely the Ministry ought to be able to find out whether there are such deposits there and give a categorical reply?

Mr. Hall: There are such deposits there, but they are not suitable for the production of aluminium.

NOTES FROM WORKS SAFETY JOTTINGS

Special Precautions with Unfamiliar Products

by JOHN CREEVEY

THROUGHOUT the chemical literature there is a vast amount of information concerning hazards which has never properly been summarised. Hazards of all types are there, duly placed on record from the experience of the few for the welfare of all who work with chemicals or operate chemical plant. Some, it is true, have become obsolete; or at any rate, they can be disregarded to some extent owing to advances in the construction of plant and apparatus and in the technique of working. Nevertheless, there are lessons to be learned even from these occurrences, when reviewed alongside those which remain of concern for safety sake. Equally surprising is it that a newly experienced hazard often takes so long to find its way into the literature, where it is then permanently on record. Sometimes the delay is occasioned by the feeling that the hazard concerned is already known, although there was ignorance on the part of those who had just gained experience. At other times there seems to be a thoughtless outlook on this matter of sharing experiences with others. But some there are who never hesitate to bring all facts possible to the notice of the industry and its workers as quickly as possible.

* * *

Hazards observed with butadiene and its peroxides have just been reported (*Ind. Eng. Chem., News Ed.*, 18, p. 404). It is but a short note and yet the facts are important, for butadiene and related compounds are now much in evidence in the literature and also in use in industry; 1:3-butadiene can be used as the starting point in making organic bases which are useful as accelerators of rubber vulcanisation; its polymerisation products can be used for electrical insulation, and in the paint industry as dispersing agents for pigments. Oils, fats, resins and waxes, and plastics have their own particular ways in which this product can be used to advantage, most of the patents concerned being of French origin. Still wider use has been found in the rubber industry, where among others French patents still predominate. Knowledge of possible hazards attending the use of the product is therefore welcome. Troubles have been voiced, though not with any real hazard attached; e.g., a Russian patent of 1934 aimed at minimising the adhesion of 1:3-butadiene to the walls of autoclaves. Now in 1940 from California comes news that explosive decomposition with formation of carbon occurred on heating butadiene in a stainless steel autoclave, although similar work previously carried out gave no unexpected occurrences. The peroxides which are formed in contact with air or oxygen can be detonated by mild heating or by mechanical shock, and in some cases the explosion is notably violent. Polymers have been found at the bottom of storage tanks which have been used for crude butadiene. These contained only 0.095 gms. of peroxide oxygen per 100 gms., but could be detonated easily by a hammer blow. They were insoluble in the butadiene, and the latter showed only a trace of peroxides.

* * *

The use of perchloric acid in the analytical laboratory provides another instance where caution must be exercised. Several workers have given general warnings of the possibility of violent reactions if prescribed analytical procedures are not closely followed; to these there is reference in G. F. Smith's *Mixed Perchloric, Sulphuric and Phosphoric Acids and their Application in Analysis* (1935) and *Perchloric Acid* (1934). In a particular case reported in 1937 (*Ind. Eng. Chem., News Ed.*, 15, p. 214) samples of vegetable oil were being digested in a mixture of nitric and perchloric acid for the determination of phosphorus, the procedure being similar to that which has been used for determining sulphur in rub-

ber. Thirty samples had passed through, but the next exploded with great violence, and injury was caused by the flying glass. A search of recent literature at the time revealed three references to similar explosions in analytical practice. It was, therefore, to be concluded that all work involving the use of perchloric acid should be carried out under a hood and also behind a metal screen, and at the same time the operator should wear goggles.

* * *

For mercury oxycyanide an explosion was reported in 1916 (*J. Ind. Eng. Chem.*, 8, 1174) as having occurred while the product was being transferred from a container to smaller storage bottles. No cause was indicated, for the product had been powdered in open mortars and exposed in other ways without any evidence of its explosive character. In 1923 (*Pharm. Weekblad*, 60, 102) another explosion was reported for this product as taking place when reducing the dried product to powder. In the previous year several cases of explosions which occurred in handling mercury oxycyanide were placed on record (*Pharm. Ztg.*, 67, 284) and (*Chem. Ztg.*, 46, 299), but even so sufficient prominence was not attained to brand this particular product as hazardous, which is still more regrettable as the mixing of mercury oxycyanide with inorganic salts and colouring matter in a ball mill during the same year (*Chem. Ztg.*, 46, 794) brought about the destruction of the mill and the death of the man in attendance. Only when a fatality had occurred were steps taken to investigate the explosive properties of the product and record them.

* * *

In the preparation of lead bromate by the interaction of solutions of potassium bromate and lead acetate, it appears that the unstable diplumbo-diaceto-bromate is obtained (*Z. angew. Chem.*, 1927, 40, 841). This product explodes at a temperature of 165° C., and also by percussion at room temperature, and is likely to detonate an adjacent batch of lead bromate. Special precautions have to be taken in drying and crushing, for at least two fatal accidents have been recorded. Nevertheless, it has been shown that lead bromate of itself will not detonate unless it contains some easily oxidisable material. Similar troubles could be recited for such products as tin nitrate containing basic nitrate, bleaching powder under certain conditions of storage, and ammoniacal silver solutions.

* * *

The use of any product with which we individually are unfamiliar will often justify a glance through the literature to see what has been placed on record as to possible hazards. Maybe the search is a fruitless one, but time has not been wasted if the product is one not commonly used. If an accident has been recorded, or some observation has been made as to possible hazards and precautions, let it not be concluded that the particular circumstances must always apply, but rather let it be a warning to take all the precautions considered advisable irrespective of conditions and procedure. Should troubles be met, do not fail to put something on record for the benefit of others, giving as much data for the case as space permits.

A MOSCOW RESEARCH INSTITUTE, according to *Chemische Industrie* (Berlin), has perfected a new rigid type of cellulose acetate gramophone record, an improvement over the flexible acetate records that came on the market some years ago. In principle it consists of a paper foil impregnated with synthetic resin and sandwiched between sheets of cellulose acetate. It can be played about 200 times and weighs less than 2 oz.

New Control Orders

Control of Aluminium

THE Minister of Aircraft Production has made the Control of Aluminium (No. 5) Order, 1940, which came into force on August 14. The new Order repeats the main provisions of the existing Order, subject to certain modifications. In particular a licence is required for the treatment, use, or consumption of aluminium scrap and aluminium alloy scrap save for the purpose of converting it into ingots. It should be noted that the grinding of foil scrap to produce powder and the "destructive" use of scrap for such purposes as steel de-oxidation or the manufacture of aluminium bronze are now subject to licence. The cleaning, crushing, bulking, and sorting of scrap in the course of collection and merchanting continue to be exempt from licence. All acquisitions of aluminium and aluminium alloy and all disposals of aluminium and of aluminium alloy must be effected under licence. Licences will not be granted to anybody to acquire or dispose of aluminium or aluminium alloy simply for the purpose of dealing in it. Further information may be obtained from the Aluminium Control, Southam Road, Banbury.

Bauxite, Cryolite and Silicon

In addition, the Ministry of Aircraft Production will be responsible for bauxite, cryolite, and silicon metal to which Ministry matters regarding this material should be addressed. The Control of Silicon (No. 1) Order, 1940, which will come into force on Wednesday, provides that silicon metal (*i.e.*, material containing not less than 97 per cent. of silicon) shall not be bought, sold, or used except under licence.

Potash Fertilisers

To assist in carrying the fertiliser policy of the Ministry of Agriculture, the Ministry of Supply is issuing a direction prohibiting the manufacture of compound fertilisers with less than five per cent. of potash, as otherwise the existing stocks might be spread over a large tonnage of compound fertilisers, many of which would be used for crops which will not give the maximum return for this fertiliser. Sellers of such compounds and of straight potash have been instructed to obtain an assurance from their customers that these fertilisers will be used only in accordance with the direction.

The question of alternative sources of potash such as blast furnace and cement flue dusts, which were used extensively in the last war, is being investigated.

Export Licensing Amendments

The Board of Trade have made the Export of Goods (Control) (No. 30) Order, which came into force on August 15, and which contains amendments as follows affecting chemicals and drugs, and the materials of the chemical engineering industry:—

Licences will be required to export, to any destination, perforated plates, sheets and strip of non-ferrous metals and alloys thereof; also anthracene, anthracene oil, iodoxy, nikethamide, mepacrine hydrochloride, pamaquin, suramin, and carbachol.

Bromethol and stibophen may not be exported without licence to any destination outside the British Empire.

Avertin, benzamine and its salts, chloral hydrate, foudadin, and hexamine may now be exported without licence to destinations within the British Empire.

Ascorbic acid (vitamin C) and its preparations, insulin, and insulin protamine with zinc are now only prohibited to be exported without licence to certain specified destinations.

No licence will in future be required to export acriflavine, preparations of agar, alypin, antrypol, arsphenamine and derivatives, salts of barbitone, bismuth compounds and preparations, cade oil, preparations of caffeine and its salts, preparations of camphor, cassia fruit, evipan and its salts, guaiacol, guaiacol carbonate, iron ammonium citrate, preparations of iron perchloride, lobelia and lobeline and salts

and preparations thereof, lycopodium, male fern and its preparations, mersalyl and its preparations, nembutal, neostibosan, pentothal sodium, percaïne, phenacetin and its preparations, salts of phenobarbitone, quassia, quillaia, sabadilla, preparations of senega, silver proteinate, silver vitellin, suphanilamide and its derivatives, including M and B 693 (Dagenan), and zinc valerianate.

Licences will be required to export to all destinations chromium compounds other than barium, lead and zinc chromates and preparations thereof; also distempers, lacquers, varnishes, paints and painters' enamels, prepared or ready mixed, containing metallic aluminium.

Licences will be required to export to certain specified destinations barium, lead and zinc chromates, and pigments containing such chromates; also distempers, lacquers, varnishes, paints and painters' enamels, prepared or ready mixed, not containing metallic aluminium; and tannic acid and tannic acid jelly.

Caustic Potash and Carbonate of Potash

The Minister of Supply has made an Order under the Defence Regulations, under which purchases by consumers of caustic potash and carbonate of potash may be made only under licence; lots not exceeding one half-ton a month are, however, exempt. It is the intention only to licence purchases where the use of these materials is essential, and where substitution is impossible. Application forms for licences can be obtained from the Secretary, Raw Materials Department, Ministry of Supply, Shell-Mex House, Strand, W.C.2. Envelopes should be marked clearly "Caustic Potash" or "Carbonate of Potash" according to the material for which application is made.

In view of the shortage of supplies of both caustic potash and carbonate of potash a single buying organisation for these salts has been set up. This buying organisation is under the chairmanship of Mr. G. Marchand, of the Glass Manufacturers' Federation, and is composed of representatives of the principal importing merchants and of the consumers. It will make purchases through a company with a nominal capital which is to be set up. Its purchases will be divided between merchants who can show that they held an established position as importers in the 12 months preceding the war on the basis of their actual imports during the first nine months of the war. The position of the distributing merchant who did not import will be safeguarded. Re-selling prices will be fixed in agreement with the Ministry and there will be a merchant's discount. Supplies of caustic potash and carbonate of potash will be obtainable from the importing merchants, who will not undersell distributing merchants. There is no intention that the ordinary channels of this trade should be altered.

Styrene Manufacture

Carbon Formation Obviated by Low Pressures

ONE of the earliest known reactions for production of styrene is the pyrolysis of benzene in presence of acetylene. Its drawback when carried out at ordinary pressure is the considerable carbon formation and the poor yield of styrene. These defects are rectified, according to F.P. 849,726 of the Consortium für Elektrochemische Industrie, by operating at comparatively low pressures. Ninety grams benzene and 20 litres acetylene (measured at 760 mm.) were passed at a pressure of 40 mm. through a tube constructed of iron-chrome alloy (Sicromal 12) heated to 900°-950° C. and connected to a condensing apparatus. Products isolated from a run included 9.5 grams styrene and 6 grams impure diphenyl. Very little carbon was deposited and the non-reacted benzene and 85 per cent. of the acetylene were recovered. When the run was repeated under ordinary pressure the tube soon became choked with carbon. It may be noted that direct conversion of benzene into styrene calls for a much higher temperature than processes now used on the industrial scale and based on the dehydrogenation of ethyl benzene. The latter are operated at temperatures of the order of 600° to 750° C.

Personal Notes

DR. JAMES NORMAN DAVIDSON has been appointed lecturer in bio-chemistry at Aberdeen University.

* * *

MR. G. W. DRAKE, B.A., B.Sc., of Devonport, has accepted an appointment as a works chemist with Lever Brothers at Port Sunlight.

* * *

MR. JOHN MCCONWAY has been appointed general manager of the Bede Metal and Chemical Co., Hebburn-on-Tyne, and MR. CHARLES MCCONWAY works manager.

* * *

MR. JOHN BENN, the eldest son of Sir Ernest Benn, and a Director of Benn Brothers, Limited (proprietors of THE CHEMICAL AGE), has been promoted to the rank of Captain.

* * *

Following receipt of a supplementary report of its Board of Examiners, the Institution of Chemical Engineers announces that MR. GORDON MASKILL SMITH, of Wellington, New Zealand, was successful in the Associate-Membership examination for 1940.

* * *

MR. J. F. CLARK, M.Sc., F.I.C., is back in Burnley on leave after an absence of nine years in Malaya, where he was analyst to the municipality of Singapore. He is due to return at the end of the year. For some years he worked in the Burnley Municipal Laboratory under Major Ross.

* * *

MR. G. H. ABBOT and MR. V. C. FAULKNER, of the Institute of Vitreous Enamellers, MR. JAMES TAYLOR, of the Institute of the Plastics Industry, and MR. D. CARTER, of the Dyestuffs Group of I.C.I., Ltd., are representing chemical interests on the committee formed by the British Colour Council to consult on matters of interior decoration.

* * *

MR. NORMAN J. HOWARD, F.C.I.C., has been appointed President of the American Waterworks Association. Before going to Canada in 1911, Mr. Howard was employed on the chemical staff of the Metropolitan Water Board. In 1911 he was appointed chemist and bacteriologist to the City of Toronto, and in 1927 was made Director of Water Purification.

OBITUARY

MR. WILLIAM THOMSON KELLY, M.C., J.P., chairman since 1930 and secretary since 1924 of Messrs. Cockburn and Co., Ltd., manufacturing and retail chemists, Glasgow, died recently at Largs, aged 47.

* * *

MR. ARNOLD SMITH, vice-president and general manager of International Laboratories, Winnipeg, died recently at Winnipeg, aged 53. A native of South Africa, Mr. Smith went to Canada in 1905, and in 1914 he was appointed vice-president and general manager of International Laboratories.

(Continued from next column.)

Again, latest practice does not confirm that most systems employ Dowtherm only above 370° F. Working in the vapour phase at sub-atmospheric pressure, temperatures as low as 200° C. are being obtained and there are very many installations, both in this country, on the Continent and in the United States, operating at temperatures between 260° and 340° C. The illustration shows a British-made boiler operating at 335° C. and capable of producing 900,000 B.Th.U. per hour.

In view of the rapidly developing importance of plant heated by these special media, we shall be obliged if you can give due prominence to these latest developments and to the fact that we maintain here at Dagenham a semi-commercial scale research plant in which the most economical methods of applying Dowtherm heating to industrial processes are worked out in collaboration with chemical and other manufacturers.—Yours faithfully,

For W. J. Fraser and Co., Ltd.,

Dagenham, August 13.

NORMAN C. FRASER,

Director.

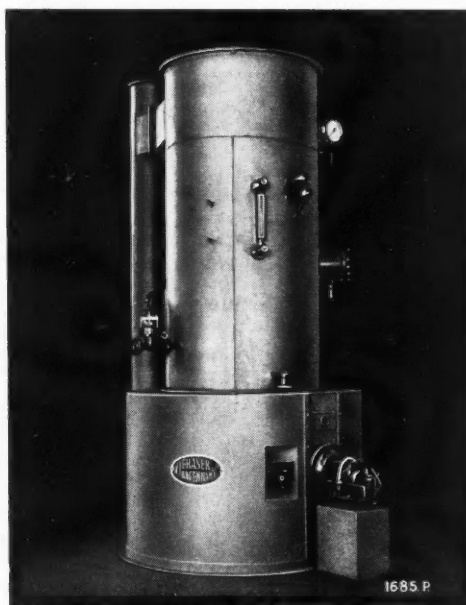
LETTER TO THE EDITOR

Organic Compounds for Industrial Heating

SIR,—We have read with considerable interest the article in your July 27 issue under the above heading. As licensees for the British Empire (excluding Canada) for the product Dowtherm, upon which your contributor has clearly based his article, we should like to make one or two supplementary points.

First, recent experience has shown that the group of triphenyl isomers originally known commercially as Dowtherm "C" is not to be recommended for temperatures over 350° C.-400° C., but the eutectic mixture of diphenyl and diphenyl-oxide originally known commercially as Dowtherm "A" can be used in the liquid phase just as readily as Dowtherm "C." Accordingly, that product has been generally superseded by Dowtherm "A," now referred to simply as Dowtherm.

As a general rule, however, these high boiling organic compounds are used in the vapour phase because a greater rate



British-made boiler operating at 335° C.

of heat transfer is obtainable across the heating film of a condensing vapour than across the heating film of a circulating liquid, and also because the vapour gives up latent—not sensible—heat, so that there is thus no temperature drop through the system and more accurate control becomes possible.

Secondly, your contributor mentions in his opening paragraph that the low pressures encountered in these vapour systems necessitate only standards of design customary for low or moderate steam pressures. Unfortunately this is not the case. In their latest catalogue the Dow Chemical Company stress that the problems of plant design are such that they now make their long experience available to industry through a special Consulting Engineering Division operated under the supervision of the well-known heat transfer expert, Mr. W. L. Badger. In fact, the high temperatures involved, together with the great power of penetration of these substances, necessitate considerable care in design and more than ordinary care in fabrication. For these reasons the Dow Chemical Company have appointed as their sole agents in this country for Dowtherm a firm of chemical engineers to act in conjunction with their own consulting engineering division in America. The special boilers or heaters that must be used are obtainable in this country from Messrs. W. J. Fraser and Co., Ltd.

(Continued at foot of previous column.)

General News

MESSRS. DUFFER BROS. AND CO., LTD., oil refiners, Crayford, Kent, are to erect plant at Wrexham, no objection having been raised, on town planning grounds, to the proposal to establish the factory.

FILMS AND SLIDES showing the effects of blast from high explosives and incendiary bombs on glass of various kinds have now been prepared by Pilkington Bros., Ltd., St. Helens. These films are to be shown to business men and those responsible for the protection of industrial premises.

A SCOTTISH AREA BOARD to speed up industrial production for war work has been appointed, with Sir Harold Yarrow, chairman of the Clydesdale Bank and of Yarrow's Shipbuilding Company, as president, and Councillor William Elger, secretary of the Scottish T.U.C., as vice-president.

THE MERCHANTING AND DISTRIBUTING CO., manufacturers, distillers, etc., formerly of Norway Wharf, Commercial Road, E.14, have now changed their address to: Atlantic Wharf, High Street, Stratford, London, E.15. (Tel.: MARYland 3882 and 3883; telegrams: "Creosote," Strat, London).

VOLUME XXII of the Experimental Researches and Reports (1939) published by the Department of Glass Technology of Sheffield University is now available at a cost of 7s. 6d. In addition to the customary array of valuable papers and abstracts, the present volume contains also a description, by Professor W. E. S. Turner, of the new buildings of the Department at "Elmfield," Sheffield.

LAST MONTH'S VOLUME of *The Nickel Bulletin*, published by the Bureau of Information on Nickel, Thames House, S.W.1, contains abstracts of recent articles and patents concerning nickel and its alloys and short reviews of the latest papers referring to these topics. The contents include "Recommended Materials for Marine Engineering," "General Utility Casting Alloys," "Improvement in Hand Tools," and "High Chromium Alloys."

AN OFFER BY MESSRS. JAMES NIMMO AND CO., LTD., to supply Glasgow Corporation with the surplus coke-oven gas from their works was considered lately by a sub-committee of the Corporation Gas Committee. Messrs. Nimmo have offered to supply the city with 500,000 c. ft. of gas per day, rising to 1,500,000 c. ft. daily, at a price of approximately 7½d. per 1,000 c. ft. of purified gas, or considerably less than half the current cost of production in the municipal plants. The supply can be put direct into the distributing mains, as the firm already has a purifying installation. Messrs. Nimmo operated a 10 years' contract with the Corporation for the supply of purified industrial gas until about three years ago.

Foreign News

COLLOIDAL ALUMINIUM SILICATE is now used in Germany, under the name of "AS 1441," as a substitute for paraffin wax, synthetic resin, or glue in the proofing of cardboard and paper containers for many classes of goods. Progress is also reported to have been made in the employment for the same purpose of colloidal silicic acid.

ACCORDING TO STATISTICS RECENTLY RECEIVED by the Department of Overseas Trade and published in the *Board of Trade Journal*, imports of chemical and pharmaceutical products into Peru amounted to 5861 soles in value for the March quarter of 1940, as compared with 4419 soles for the corresponding period of 1939 (21 soles = £1). Imports from and exports to the U.K. were 5026 and 20,305 soles respectively, as against 5381 and 14,104. Exports to Germany for this year were nil.

GERMANY MAY BE PREPARED, according to a statement in *World Trade Notes*, to supply Denmark with 130,000 tons of potash salts during 1940/41, and seems prepared to supply 50,000 tons of nitrogenous fertilisers from Germany and to arrange for some 175,000 tons from Norway. These quantities should be sufficient to cover Denmark's fertiliser requirements, except phosphates, during the year. However, the Danish agricultural industry is reckoning on a violent decline in agricultural production, which seems to indicate that the Danes are not over-optimistic with respect to their fertiliser supplies. Feeding stuffs do not seem to be obtainable from or through Germany to any appreciable extent.

From Week to Week

TO SAFEGUARD HER SUPPLIES OF FUEL during prevailing conditions, Sweden has been giving attention to her numerous peat bogs, which constitute an important source of low-grade fuel, hitherto very sparingly exploited. It is estimated that this year's production will total about 150,000 tons, which corresponds to about 75,000 tons of coal. Among the methods to be tested is the briquetting of the peat and a State-owned plant has recently been started with an annual capacity estimated at 50,000 tons of ready briquettes.

SUCCESSFUL OPERATION ON A COMMERCIAL SCALE in Japan, according to *World Trade Notes*, is claimed for a base-metal catalyst developed in the Tokyo Imperial Industrial Research Laboratory for the oxidation of ammonia to nitric acid. It is alleged that the new catalyst operates in a pilot plant producing at an efficiency of 93-96 per cent. While adoption of the catalyst was due to a shortage of platinum in Japan, it is considered that the new material would displace platinum even under normal conditions.

Chemical and Allied Stocks and Shares

CONFIDENCE in the outcome of the next phase of the war has continued to be reflected by a firm undertone in the stock and share markets. The volume of business was further reduced, but on the other hand, sentiment had the benefit of absence of selling pressure. So pronounced has been the disinclination to dispose of good class industrial securities at current levels that the market is none too well supplied with shares. Consequently prices have tended to respond sharply to only moderate improvement in demand.

Following an earlier decline, Imperial Chemical rallied to 25s. 7½d. and the 7 per cent. preference at 28s. 9d. were within 3d. of the price ruling a week ago. Various other shares of companies associated with the chemical and allied trades also became firmer, including British Oxygen, which were better at 56s. 3d., while Borax Consolidated at 22s. 6d., and Barry and Staines at 21s. 10½d. held the better prices made recently. Wall Paper Manufacturers' deferred units at 12s. 6d. also kept last week's improvement. Dunlop Rubber became firmer at 28s., but Lever and Unilever were easier at 18s. 9d., although the 8 per cent. preference at 21s. 3d. tended to show a steadier tendency.

Lawes Chemical 10s. ordinary shares changed hands around 7s. 6d.; the results fall to be issued next month. Greiff-Chemicals Holdings 5s. ordinary continued to be quoted at par, while both British Glues and Blythe Colour were also at 5s. Business in Sanitas Trust 10s. shares took place at 12s. 9d. at one time, and Johnson Matthey 4 per cent. debentures have transferred at 94. United Glass Bottle remained at 43s. 9d. and Canning Town Glass 5s. shares showed business at 4s. B. Laporte were again 48s. 9d., but were inactive. Elsewhere, Lacrinoid Products 2s. shares were around 1s. following declaration of the interim dividend, while British Industrial Plastics 2s. shares were reported to be slightly firmer at 1s. 6d. British Drug Houses £1 ordinary continued to be quoted at par, and remained firmly held. Monsanto Chemicals 5½ per cent. preference shares were again 21s. 3d. Sentiment in regard to cement shares continued to be assisted by the demand for materials for A.R.P. and defence purposes. Associated Cement at 53s. 9d. were unchanged on balance, but Tunnel Cement improved, and elsewhere British Plaster Board 5s. shares were quoted at 8s. 3d.

Stewarts and Lloyds were firm at 34s. 6d., but Tube Investments at 76s. 10½d. lost part of an earlier improvement. Staveley ordinary shares were steady at 38s. 9d.; the interim dividend is due next month. Consett Iron were better at 5s. 1½d., and Dorman Long remained around 15s. In other directions, Distillers transferred around 55s. 9d., and United Molasses around 19s. 3d. Pinchin Johnson were slightly easier at 15s., the tendency being to await the interim dividend, which is usually announced next month. International Paint shares remained at 62s. 6d., and Goodlass Wall 10s. ordinary were again 6s. 3d. Among other shares, Courtaulds ordinary and British Celanese second preference were inclined to improve, while Calico Printers' preference were firmer on the hope that the forthcoming results may announce a payment on account of dividend arrears. British Aluminium and Turner and Newall were among shares inclined to make better prices, and both Murex and Metal Box were firm.

Elsewhere, Boots Drug were easier at 37s. 3d., and Sangers made the slightly lower price of 17s. 7½d., but Beechams Pills 2s. 6d. deferred were steady at 7s. 4½d., aided by hopes that the forthcoming interim dividend may be maintained. Lower prices have ruled for "Shell" and other oil shares; Anglo-Iranian were 27s. 6d.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CELLACTITE AND BRITISH URALITE, LTD., Rochester. (M., 17/8/40.) July 31, £10,000 (not ex.) debenture to Lloyds Bank, Ltd.; general charge. *£83,400. July 9, 1940.

Satisfactions

PYRITES CO., LTD., London, E.C. (M.S., 17/8/40.) Satisfaction August 1, of Trust Deed registered December 9, 1927.

WILSON AND KITCHIN, LTD., Whitehaven, chemists. (M.S., 17/8/40.) Satisfaction August 1, of charge registered May 16, 1928.

County Court Judgments

HAZARD QUARRIES, LTD., Midland Bank Chambers, Totnes, lime burners. (C.C.J., 17/8/40.) £28 9s. 5d. June 28.

RADCLIFFE, JNO., 27 Sherwell Valley Road, Chetaton, Torquay, engineer chemist. (C.C.J., 17/8/40.) £16 14s. 6d. June 20.

Company News

The Anchor Chemical Co., Ltd., announce an interim dividend on ordinary shares for the year ending November 30, 1940, at the rate of 10 per cent. per annum.

British Chemical Prices

Market Reports

THE trade in general chemicals during the past week, although not particularly brisk, has followed an even trend and dealers report a steady flow of deliveries to the chief consuming industries; in addition a good export inquiry from Empire countries appears in circulation. Price movements have been few, the only changes of importance being for chlorate of soda, which is now 30s. per ton dearer, and a further advance in quotations for tartaric acid. Elsewhere values are firm and unchanged with a number of imported products continuing at high levels. Most of the potash products are available in restricted quantities and steps have been taken to regulate supplies of caustic potash and carbonate of potash. Moderately active trading conditions prevail in the market for coal tar products. Carboic acid crystals are in good request and a fair export inquiry for naphthalene is reported.

MANCHESTER.—After a slight interruption of contract deliveries to consuming works last week conditions in this respect are now pretty well to the normal level of recent weeks and from this point of view fairly satisfactory reports have been forthcoming on the Manchester chemical market. In most directions good quantities of the leading heavy products, including bleaching and finishing materials, are being absorbed. Spot offers of a number of chemicals continue on the short side and the price tendency is upward still. In the tar products market a steady demand is being experienced for the benzols, toluols and naphthas.

GLASGOW.—There is practically no change in the position of the heavy chemical trade in Scotland this week—orders are coming in steadily with an occasional delay in supply owing to some shortages in certain articles for immediate delivery only. Prices are still well maintained and do not show any disposition to drop.

Price Changes

Soda, Caustic.—Solid, 76/77% spot, £14 10s. per ton d/d station. Sodium Chlorate.—£34 to £43 per ton, d/d, according to quantity. Sodium Sulphate (Salt Cake).—Unground, spot, £4 3s. 6d. per ton d/d station in bulk. MANCHESTER: £4.

Tartaric Acid.—2s. 0½d. per lb., less 5% cartage paid for lots of 5 cwt. and upwards. Imported material, 2s. 3d. to 2s. 6d. per lb., ex wharf. MANCHESTER: 2s. 2d. per lb.

Latest Oil Prices

HULL.—August 14.—American turpentine, spot, 54s. per cwt. in barrels, ex store.



The B.D.H. equipment for pH control includes indicators, buffer tubes and buffer solutions, comparator cases, capillator outfits, and also the Lovibond Comparator and Nessleriser.

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that by employing the B.D.H. Comparator Case with standard buffer tubes containing an appropriate indicator the pH of coloured or hazy liquids can be expeditiously and accurately determined.

Suitable indicators and equipment can be supplied for any industrial process in which at some stage the determination of the pH value of a liquid is of importance. A thirty-two page booklet "pH Values, What they are and how to determine them," will be supplied, free of charge, on request.

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CLASSIFIED SECTION

NOTE: Trade announcements, other than strictly second-hand and job lines, cannot be inserted in these pages except by firms whose advertisements run in the display columns

EDUCATIONAL

UNIVERSITY OF MANCHESTER.
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PROSPECTUS containing full particulars of the LECTURES and LABORATORY COURSES qualifying for the Degrees in Chemistry will be forwarded on application to the REGISTRAR. Applications for admission to the Research Laboratories should be made to the Director of the Chemical Laboratories. The Session commences on Thursday, September 26th.

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CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone: 3285 East.

100 REBUILT Hydro Extractors by all leading makers from 18 in. upwards with countershafts attached and safety covers. Jacketed Steam Pans, various sizes. List on request. Seen at Randalls, Arundel Terrace, Barnes. Telephone: Riverside 2436.

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EXCELLENT COKE OVEN PLANT.

For Immediate Disposal.

- 2 Mild Steel Vertical Benzole Scrubbers, 9 ft. dia. by 37 ft. 6 in. high.
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- 1 Pelouze Tar Separator for 3,500,000 cu. ft. of Gas per day.
- 1 Mild Steel Cylindrical Vertical Gas Cooler, 8 ft. 3 in. by 28 ft. high.
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- 2 Oil Heaters.
- 1 Condenser and Separator.
- 1 Rectifying Still, by Dempster, capacity 2500 gallons.
- 2 Cast Iron Vertical Ammonia Stills, 4 ft. dia. by 19 ft. high.
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Quantity of Riveted Steel Piping from 22 in., 24 in. and 26 in. bore, and 14 in. and 22 in. Valves.

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1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each. Clearing at 30s. dozen. Also Large Quantity Filter Cloths, cheap. WILSONS, Springfield Mills, Preston, Lancs. Phone 2198.

COMBINED AUTOMATIC WEIGHING, MEASURING and Mixing Plant, with six weighers, capacity about one ton per hour, with 20 h.p. and 7½ h.p. motors, elevator, conveyor, vibro-screen, etc. Can be seen erected in Kent. THOMPSON AND SON (MILLWALL), LTD., Cuba Street, Millwall, London, E.14. East 1844.

50,000 FEET brand new Balata and Rubber Belting, all popular sizes. Every belt guaranteed and sent on approval at bargain prices. Write for stock and price lists, F. Taylor & Sons (Manchester), Ltd., Barr Hill Works, Salford, 6, Lancs.

STAG BALL MILL, 4 ft. 6 in. by 10 ft. 0 in. and mechanical separator. 2-4 ton Toplis Luffing Jib Cranes. 35 ft. by 5 ft. Manlove Alliott Dryer, Fan and Cyclone. T.K. 3 Pennsylvania Slow Speed Ring Hammer Mill. All near London and in first-class condition. Write Box No. 1989, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

600

MILD Steel Rotating Autoclave by W. J. Fraser, Ltd., 7 ft. 0 in. dia. by 2 ft. 6 in. long, with 2 ft. 6 in. cone at either end.

Gas Fired Copper Tilting Pan by Thomas Hartley, 2 ft. 8 in. dia. by 2 ft. 2 in. deep, capacity approx. 70 galls.

Totally Enclosed Vertical Mild Steel Steam Jacketed Pan, 5 ft. 0 in. dia. by 7 ft. 4 in. deep, the whole mounted on cast iron stools.

Welded Steel Horizontal Steam Jacketed Boiling Vessel, 6 ft. 0 in. long by 3 ft. 0 in. dia., arranged with usual fittings.

Welded Steel High Pressure Mixer by Widnes, 5 ft. 0 in. dia. by 2 ft. 6 in. deep, vertical agitator driven through machine cut wheel and pinion, from fast and loose pulleys.

Vertical Enclosed Mixer, 2 ft. 0 in. dia. by 2 ft. 0 in. deep, vertical agitator driven through machine cut crown wheel and pinion from fast and loose pulleys.

Horizontal Cylindrical Mixer by Brinjes & Goodwin, 24 in. long by 2 ft. 6 in. dia. arranged with feed opening 1 ft. 10 in. by 1 ft. 4 in., agitator driven from fast and loose pulleys.

Copper Steam Jacketed Tilting Pan by Low & Duff, pan 31 in. dia. by 22 in. deep, mounted in cast iron cradle.

Torrance Micro Single Roll Grinding Mill, 14 in. long by 7 in. dia. roll, arranged with cast feed hopper 11 in. by 13 in. 30 in. Disintegrator by Christy & Norris, speed 2,500 r.p.m. Complete with small elevator and vibratory screens.

No. 1 KEK Grinding Mill. Manganese steel pin grinding discs driven through machine cut phosphor bronze worm wheel and pinion.

THREE AVAILABLE.

Centrifugal Separator by Marchent, underdriven brass cage 11 in. dia. by 13½ in. deep, driven through fast and loose pulleys, mounted on fabricated steel stand.

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